ANNEXURE I

MODULE-WISE COURSE CONTENT AND OUTCOME				
SL.NO	**MODULE NAME**	**MODULE CONTENT**	**MODULE LEARNING OUTCOME**	**DURATION (HRS)**
1.	Introduction to HyperMesh	· Overview of HyperMesh and its role in CAE. · User interface and basic navigation. · File handling: Importing/exporting CAD and FE models. · Introduction to finite element analysis (FEA) concepts.	· Explore the purpose and scope of HyperMesh in CAE processes. · Navigate the interface and perform basic file operations. · Recognize the connection between CAD and FEM.	5
2.	Geometry Import, Cleanup, and Mid-surfacing	· Importing CAD geometry into Hyper Mesh. · Geometry cleanup: Removing errors, repairing geometry. · Mid-surfacing techniques for thin-walled structures.	· Import and prepare CAD geometry for meshing. · Clean up geometry to ensure smooth meshing workflows. · Create mid-surfaces for complex models efficiently.	10
3.	Meshing Fundamentals	· 1D meshing: Beam and bar elements. · 2D meshing: Shell elements (tria and quad). · 3D meshing: Tetra, hex, and pyramid elements. · Meshing quality parameters	· Apply appropriate meshing techniques for various models. · Generate high-quality meshes that meet industry standards. · Troubleshoot and optimize mesh quality.	11

4.	Material Properties and Boundary Conditions	·· Assigning material properties to elements. · Defining loads and boundary conditions. · Applying constraints and supports in HyperMesh. · Overview of real-world engineering problem setup	· Understand the application of material properties and constraints. · Set up simulation models with appropriate boundary conditions. · Translate engineering problems into FE models.	10
5	Advanced Meshing Techniques	Hexahedral meshing for complex geometries. · Techniques for meshing assemblies and contact modeling. · Batch meshing and automation scripts in HyperMesh. · Handling advanced geometrical features like holes and fillets.	· Use advanced meshing techniques for large-scale models. · Automate repetitive tasks using HyperMesh scripting features. · Solve challenges in complex model meshing	9

ANNEXURE II

OVERALL COURSE LEARNING OUTCOME AND USECASES			
LEARNING OUTCOME	**ASSESSMENT CRITERIA**	**PERFORMANCE CRITERIA**	**USECASES**
· Perform geometry cleanup, mid-surfacing, and model simplification.	· Written quizzes or exams to evaluate understanding of FEA concepts and Hyper Mesh features. · Assessment of problem-solving approaches for pee-processing tasks.	· Ability to import various CAD file formats without loss of geometric integrity. · Tools for geometry cleanup and simplification (e.g., fixing gaps, removing slivers). · Efficiency in creating mid-surfaces for thin-walled structures.	**Automotive Industry** · Crashworthiness **Analysis**: Meshing and pre-processing for crash simulations. · NVH **Analysis**: Pre-processing for noise, vibration, and harshness simulations. · Structural **Durability**: Meshing components for fatigue and load-bearing analysis.
· Create high-quality 1D, 2D, and 3D meshes for finite element analysis.	· Assignments on meshing, geometry cleanup, and mid-surfacing. · Evaluation of mesh quality parameters like aspect ratio, skewness, and war page.	· Generation of high-quality 1D, 2D, and 3D meshes. · Compliance with industry standards for mesh quality (aspect ratio, skewness, warpage, and Jacobian). · Support for advanced meshing techniques like hex-dominant or tetrahedral meshing.	**Aerospace Industry**: ● **Aeroelasticity Studies**: Pre-processing models for fluid-structure interaction simulations. ● **Thermal Analysis**: Meshing components for thermal management and heat flow analysis.

· Defining loads and boundary conditions. · Applying constraints and supports in Hyper Mesh. · Overview of real-world engineering problem setup.	· A hands-on project involving a complete CAE workflow, from geometry import to result interpretation. · Parameters for evaluation: model accuracy, solver compatibility,	· Speed and accuracy in defining material properties, loads, and boundary conditions. · Ease of handling large assemblies or complex models. · Automated tools like batch meshing and scripting for repetitive tasks.	**Mechanical Engineering**: ● **Structural Analysis**: Meshing and analysis of beams, frames, and machine components. ● **Weld and Joint Analysis**: Pre-processing assemblies with welding or bolting constraints.
· Use advanced meshing techniques and perform topology optimization. · Validate and iterate designs based on simulation outcomes.	Tests on applying topology and shape optimization tools to improve designs.	· Capability to handle large-scale models with high geometric and meshing complexity. · Stability under heavy computational loads. · Parallel processing and hardware optimization support.	**Civil Engineering**: ● **Bridge Load Analysis**: Meshing and defining boundary conditions for structural integrity checks. ● **Seismic Response Analysis**: Setting up models for earthquake simulations.
· Apply Hyper Mesh in practical applications like automotive crash testing, structural integrity analysis, and thermal modeling. · Conduct end-to-end analysis for	Group projects to assess collaborative problem-solving and communication skills.	· Intuitive user interface and ease of navigation. · Customization options like macros, scripting, and templates.	**Medical Devices**: ● **Biomechanics Simulations**: Meshing prosthetics or ● implants for stress and motion analysis.

engineering projects.		· Accessibility of help documentation and tutorials.	● **Fluid Flow in Devices**: Pre-processing for blood flow or fluid dynamics simulations in medical devices.

LIST OF FINAL PROJECTS (PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOME)	
SL.NO	**FINAL PROJECT**
1	**Geometry Handling**: All projects involve importing, cleaning, or simplifying CAD models.
2	**Meshing Skills**: Projects span 1D (frames), 2D (thin-walled structures), and 3D (solid bodies) meshing.
3	**Boundary Conditions & Solvers**: Each project involves applying material properties, loads, and exporting models to solvers.
4	**Optimization**: Projects like landing gear and bridge deck analyses incorporate topology and weight optimization.
5	**Real-World Application**: Cover diverse industries, ensuring practical relevance.

ANNEXURE III

COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 70)				
ASSESSMENT CRITERIA	DESCRIBE THE CRITERIA OF THE BELOW CATEGORY PERFORMANCE			TOTAL MARKS
	FAIR	GOOD	EXCELLENT	
1.Demonstrates ability to perform job-specific tasks effectively, using relevant tools,	10	15	20	20
2.Applies theoretical concepts to practical scenarios with accuracy and relevance	7	12	15	15
3.Completes assigned projects or use cases demonstrating innovation	20	25	25	25
4.Communication and Reporting	5	7	10	10